IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Richard E. Smalley et al.	§	Serial No: To Be Assigned (division of application Serial No. 09/380,545)
For: CARBON FIBERS FORMED FROM SINGLE-WALL CARBON NANOTUBES	§	Filed: CONCURRENTLY HEREWITH
	§	Group Art Unit: 1754 (anticipated)
Atty Dkt: 11321-P012USD9	§	Prior Examiner: Stuart Henderson 703.308.2539

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PRELIMINARY AMENDMENT ACCOMPANYING REQUEST FOR FILING DIVISIONAL APPLICATION UNDER 37 C.F.R. § 1.53(b)

Sir:

This paper accompanies a Request for Filing Divisional Application Under 37 C.F.R. § 1.53(b) and associated filing fee therefor ("the Request"). If the fee payment is missing or insufficient in amount, or if any other fees are determined to be due, the Assistant Commissioner, Commissioner, and/or the Director of the U.S. Patent & Trademark Office is/are hereby authorized to charge any such fees (or credit any overpayment) to Winstead Sechrest & Minick Deposit Account No. 23-2426, referencing matter number 11321-P012USD9.

AMENDMENTS

In the Title

Please amend the title by replacing the present title with the following:

--METHODS FOR PRODUCING COMPOSITES OF SINGLE-WALL CARBON NANOTUBES AND COMPOSITIONS THEREOF--

In the Abstract

Please amend the abstract by replacing the present abstract with the following:

-- This invention relates generally to a method for producing composites of single-wall carbon nanotubes (SWNTs) and compositions thereof. In one embodiment, the present invention involves a method of producing a composite material that includes a matrix and a carbon nanotube material embedded within said matrix. In another embodiment, a method of producing a composite material containing carbon nanotube material is disclosed. This method includes the steps of preparing an assembly of a fibrous material; adding the carbon nanotube material to the fibrous material; and adding a matrix material precursor to the carbon nanotube material and the fibrous material.--

In the Specification

Please amend the specification as noted on page 5, paragraph 11 of the Request by inserting before the first line of the specification the following:

--RELATED APPLICATIONS

This application is a division of co-pending prior U.S. patent application Serial No. 09/380,545, filed on September 3, 1999, entitled "CARBON FIBERS FORMED FROM SINGLE-WALL CARBON NANOTUBES," which is the 35 U.S.C. § 371 national application of International Application Number PCT/US98/04513 filed on March 6, 1998, which designated the United States, claiming priority to: provisional U.S. patent application Serial

Number 60/067,325, filed on December 5, 1997; provisional U.S. patent application Serial Number 60/064,531, filed on November 5, 1997; provisional U.S. patent application Serial Number 60/063,675, filed on October 29, 1997; provisional U.S. patent application Serial Number 60/055,037, filed on August 8, 1997; provisional U.S. patent application Serial Number 60/047,854, filed on May 29, 1997; and provisional U.S. patent application Serial Number 60/040,152, filed on March 7, 1997. Each of the foregoing applications is commonly assigned to the assignee of the present invention and is hereby incorporated herein by reference in its entirety.

This application discloses subject matter related to the subject matter of U.S. patent application Serial Number 10/000,746, filed on November 30, 2001 in the name of Daniel T. Colbert et al., entitled "MACROSCOPICALLY MANIPULABLE NANOSCALE DEVICES MADE FROM NANOTUBE ASSEMBLIES," which application is commonly assigned to the assignee of the present invention.--

In the Claims

Please amend the claims as follows:

A. Please cancel claims 1-116 and 141-162 without prejudice or disclaimer to the subject matter thereof.

B. Please amend claim 120 as follows:

120. (Amended) The composite material of claim 119, wherein said thermosetting polymer comprises a polymeric material selected from the group consisting of phthalic/maleic type polyesters, vinyl esters, epoxies, phenolics, cyanates, bismaleimides, and nadic end-capped polyimides.

C. Please amend claim 122 as follows:

122. (Amended) The composite material of claim 119, wherein said thermosetting polymer comprises a polymeric material selected from the group consisting of phthalic/maleic type

polyesters, vinyl esters, epoxies, phenolics, cyanates, bismaleimides, and nadic end-capped polyimides.

D. Please amend claim 127 as follows:

127. (Amended) The composite material of claim 117, wherein said carbon nanotube material comprises ropes up to about 10^3 single-wall carbon nanotubes.

E. Please amend claim 128 as follows:

128. (Amended) The composite material of claim 117, wherein said carbon nanotube material comprises fibers of greater than 10^6 single-wall carbon nanotubes.

F. Please amend claim 129 as follows:

129. (Amended) The composite material of claim 126 further comprising an additional fibrous material.

G. Please amend claim 130 as follows:

130. (Amended) The composite material of claim 126 wherein said carbon nanotube material is modified to interact with said matrix material.

H. Please amend claim 138 as follows:

138. (Amended) The method of claim 131 wherein said carbon nanotube material comprises tubular carbon nanotube molecules.

I. Please amend claim 139 as follows:

139. (Amended) The method of claim 131 wherein said carbon nanotube material comprises ropes of up to about 10^3 single-wall carbon nanotubes.

J. Please amend claim 140 as follows:

140. (Amended) The method of claim 131 wherein said carbon nanotube material comprises fibers of greater than 10^6 single-wall carbon nanotubes.

K. Please add the following new claims 163-213:

163. (New) The composite material of claim 127 further comprising an additional fibrous material.

164. (New) The composite material of claim 128 further comprising an additional fibrous material.

165. (New) The composite material of claim 127 wherein said carbon nanotube material is modified to interact with said matrix material.

166. (New) The composite material of claim 128 wherein said carbon nanotube material is modified to interact with said matrix material.

167. (New) The method of claim 136 wherein said carbon nanotube material comprises tubular carbon nanotube molecules.

168. (New) The method of claim 136 wherein said carbon nanotube material comprises ropes of up to about 10^3 single-wall carbon nanotubes.

169. (New) The method of claim 136 wherein said carbon nanotube material comprises fibers of greater than 10^6 single-wall carbon nanotubes.

170. (New) The composite material of claim 117 comprising a mixture of single-wall carbon nanotubes having lengths in the range between 5 and 500 nm.

171. (New) A composite material comprising carbon nanotubes, a structural constituent and a matrix material.

172. (New) The composite material of claim 171 wherein the structural constituent comprises a material selected from the group consisting of cellulose, carbon, glass, graphite, silicon oxide, carbon steel, aluminum oxide, beryllium, beryllium oxide, boron, boron carbide, boron nitride, chromium, copper, iron, nickel, silicon carbide, silicon nitride, alumina yarn, alumina-boria-silica, zirconia-silica, zircona, alumina, quartz, molybdenum, stainless steel, titanium boride, tungsten, zirconium oxide and combinations thereof.

173. (New) The composite material of claim 171 wherein the matrix comprises a polymer.

174. (New) The composite material of claim 173 wherein the polymer comprises a thermosetting polymer.

175. (New) The composite material of claim 174 wherein the thermosetting polymer comprises a polymeric material selected from the group consisting of phthalic/maleic type polyesters, vinyl esters, epoxies, phenolics, cyanates, bismaleimides and nadic end-capped polyimides.

176. (New) The composite material of claim 173 wherein the polymer comprises a thermoplastic polymer.

177. (New) The composite material of claim 176 wherein the thermoplastic polymer comprises a polymeric material selected from the group consisting of polysulfones, polyamides, polycarbonates, polyphenylene oxides, polysulfides, polyether ether ketones, polyether sulfones, polyamide-imides, polyetherimides, polyimides, polyarylates, liquid crystalline polyesters and combinations thereof.

178. (New) The composite material of claim 171 wherein the matrix material comprises a metal.

179. (New) The composite of claim 178 wherein the metal comprises aluminum.

180. (New) The composite material of claim 171 wherein the matrix material comprises a ceramic.

181. (New) The composite material of claim 180 wherein the ceramic comprises a material selected from the group consisting of glass ceramics, oxides, nitrides, carbides and combinations thereof.

182. (New) The composite material of claim 171 wherein the matrix material comprises a cermet.

183. (New) The composite material of claim 182 wherein the cermet comprises a material selected from the group consisting of carbide-base cermets, refractory cermets and combinations thereof.

184. (New) The composite material of claim 171 wherein the carbon nanotubes comprise single-wall carbon nanotubes that have been subjected to a purification process.

185. (New) The composite material of claim 117 wherein the carbon nanotubes comprise single-wall carbon nanotubes that have a homogeneous characteristic selected from the group consisting of lengths, diameters, helicities or combinations thereof.

186. (New) The composite material of claim 117 comprising carbon nanotube ropes, wherein each of the carbon nanotube ropes comprise at most 10^3 individual nanotubes.

187. (New) The composite material of claim 117 comprising carbon nanotube fibers, wherein each of the carbon nanotube fibers comprise at least 10^6 individual nanotubes.

188. (New) The composite material of claim 117 wherein the carbon nanotubes are in a form selected from the group of felts, cut lengths of nanotube ropes, cut lengths of nanotube fibers and combinations thereof.

189. The composite material of claim 117 wherein the composite material further comprises:

(a) a first area having a first homogeneous characteristic selected from the group consisting of lengths, diameters, helicities and combinations thereof;

(b) a second area having a second homogeneous characteristic selected from the group consisting of lengths, diameters, helicities and combinations thereof; and

(c) wherein the first homogeneous characteristic is different from the second homogeneous characteristic.

190. (New) The composite material of claim 117 wherein the carbon nanotubes comprise chemically-derivatized single-wall carbon nanotubes, chemically-derivatized ropes of single-wall carbon nanotubes, chemically-derivatized fibers and combinations thereof.

191. (New) The composite material of claim 190 wherein the chemically-derivatized single-wall carbon nanotubes have side-wall defects.

192. (New) The composite material of claim 190 wherein the chemically-derivatized single-wall carbon nanotubes have side-wall bonding sites.

193. (New) The composite material of claim 117 further comprising single-wall carbon nanotubes having side-wall modifications capable of an interaction with the matrix material, wherein the interaction is selected from the group consisting of physical, chemical and combinations thereof.

194. (New) The composite material of claim 191 wherein at least one of the side-wall defects comprise an impurity.

195. (New) The composite material of claim 194 wherein the impurity comprises a substance selected from the group consisting of boron, boron nitride and combinations thereof.

196. (New) A laminate comprising fibrous material impregnated with a polymer matrix material, wherein the matrix material comprises single-wall carbon nanotubes.

197. (New) The laminate of claim 196 wherein the fibrous material comprises graphite fiber.

198. (New) The laminate of claim 196 wherein the matrix material comprises an epoxy.

199. (New) The laminate of claim 196 wherein the fibrous materials are arranged in layers.

200. (New) A composite comprising single-wall carbon nanotubes having loops interpenetrated by a matrix material.

201. (New) A composite comprising single-wall carbon nanotubes and a polymer, wherein the polymer has at least one pendant group capable of an interaction with the single-wall carbon nanotubes.

202. (New) The composite of claim 201 wherein the interaction is promoted by photolysis.

203. (New) A method for producing a composite material comprising:

(a) introducing a matrix material;

(b) combining a carbon nanotube material comprising a plurality of single-wall carbon nanotubes with the matrix material; and

(c) forming the composite material.

204. (New) A method for producing a composite material comprising:

(a) introducing a matrix material precursor;

(b) combining a carbon nanotube material comprising a plurality of single-wall carbon nanotubes with the matrix material precursor; and

(c) forming the composite material.

205. (New) The method of claim 203 wherein the carbon nanotube material is dispersed in a liquid carrier.

206. (New) The method of claim 205 wherein the liquid carrier comprises a liquid selected from the group consisting of water and an organic solvent.

207. (New) The method of claim 204 further comprising converting the matrix material precursor to form the matrix material.

208. (New) The method of claim 207 wherein the combining step occurs before the converting step.

209. (New) The method of claim 208 wherein the carbon nanotube material is aligned by an electric field before the converting step.

210. (New) The method of claim 207 wherein the converting step comprises polymerization of the matrix material.

211. (New) The method of claim 207 further comprising pre-forming the carbon nanotubes into a structure before the combining step.

212. (New) The method of claim 203 further comprising combining a fibrous material with the carbon nanotube material and the matrix material.

213. (New) A method of producing a composite material:

(a) dispersing carbon nanotube material in a matrix material;

(b) impregnating a fiber material with the matrix material; and

(c) forming a laminated composite material comprising the fiber material, the matrix material and carbon nanotubes.

REMARKS

A. *Status of the Application.* On September 3, 1999, Applicant filed the parent patent application, U.S. patent application Serial No. 09/380,545, which included originally filed claims 1-162. In an Office Action, dated June 20, 2000, ("the Office Action") the Examiner subjected the claims to a restriction requirement. According to the Office Action, the parent patent application's claims were directed to eleven (11) distinct inventions. Applicant elected the invention of Group VIII in the parent patent application. The present divisional application is directed to the invention of Group XI, which were identified as the invention claimed by originally filed claims 117-140.

Accordingly, originally filed claims 117-140 remain in the application, and the other originally filed claims -- claims 1-116 and 141-162 -- are cancelled herein without prejudice or disclaimer to the subject matter thereof. Additionally, claims 163-213 have also been added herein. No new matter is added by the addition of these claims.

B. *Amended Claims.* Claims 120, 122, 127-130 and 138-140 are amended herein. The Applicant respectfully asserts that the amendment to claims 120, 122, 127-130 and 138-140,

and incorporated by reference in any claims depending therefrom, are not narrowing amendments made for a reason related to the statutory requirements for a patent that will give rise to prosecution history estoppel. *See Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 555, 566, 56 U.S.P.Q.2d 1865, 1870 (Fed. Cir. 2001).

Attached hereto is a marked-up version of the changes made to claims 120, 122, 127-130 and 138-140 by the current amendment. The attached page is captioned **"Version with Markings to Show Changes Made."**

CONCLUSION

It is believed that each of the claims now pending in the present application recites elements neither taught nor suggested by the prior art. Further, it is believed that the application as a whole is in proper form and condition for allowance. If the Examiner believes that the application may be placed in even better condition for allowance, he or she is invited to contact the undersigned at the telephone number noted below. Alternatively, or in addition, if the Examiner believes that an Examiner interview would be beneficial, the Examiner is invited to note that the undersigned has ready access to the videoconferencing facilities of the South Central Intellectual Property Partnership at Rice University in Houston, Texas. The inventors and the undersigned would welcome the opportunity to use those facilities to clarify any issues deemed to remain unresolved.

Respectfully submitted,

Date: December 28, 2001

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Version with Markings to Show Changes Made

120. (Amended) The composite material of claim 119, wherein said thermosetting polymer comprises a polymeric material [is] selected from the group consisting of [phthalic/maelic] phthalic/maleic type polyesters, vinyl esters, epoxies, phenolics, cyanates, bismaleimides, and nadic end-capped polyimides.

122. (Amended) The composite material of claim 121, wherein said thermoplastic polymer comprises a polymeric material [is] selected from the group consisting of polysulfones, polyamides, polycarbonates, polyphenylene oxides, polysulfides, polyether ether ketone, polyether sulfones, polyamide-imides, polyetherimides, polyimides, polyarylates, and liquid crystalline polyesters.

127. (Amended) The composite material of claim 117, wherein said carbon nanotube material comprises ropes up to about 10^3 [SWNTs] single-wall carbon nanotubes.

128. (Amended) The composite material of claim 117, wherein said carbon nanotube material comprises fibers of greater than 10^6 [SWNTs] single-wall carbon nanotubes.

129. (Amended) The composite material of claim 126[, 127, or 128,] further comprising an additional fibrous material.

130. (Amended) The composite material of claim 126[, 127, or 128,] wherein said carbon nanotube material is modified to interact with said matrix material.

138. (Amended) The method of claim 131 [or 136] wherein said carbon nanotube material comprises tubular carbon nanotube molecules.

139. (Amended) The method of claim 131 [or 136,] wherein said carbon nanotube material comprises ropes of up to about 10^3 [SWNTs] single-wall carbon nanotubes.

140. (Amended) The method of claim 131 [or 136,] wherein said carbon nanotube material comprises fibers of greater than 10^6 [SWNTs] single-wall carbon nanotubes.